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Indian Standard

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PART XI HYDROLOGY

Section 2 Precipitation and Run off

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GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART XI HYDROLOGY

Section 2 Precipitation and Run Off

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Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART XI HYDROLOGY

Section 2 Precipitation and Run Off

0. FOREWORD

0.1 This Indian Standard (Part XI/Sec 2) was adopted by the Indian Standards Institution on 24 February 1972, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of Indian Standards has been published covering various aspects of river valley projects and a large number of similar standards is in the process of formulation. These standards include technical terms, the precise definitions of which are required to avoid ambiguity in their interpretation. To achieve this end, the Institution is bringing out ' Indian Standard Glossary of terms relating to river valley projects ' (IS : .4410) which is being published in parts.

0.3 Part XI covers the important field of hydrology which is a separate science by itself. In view of the vastness of the subject, it is proposed to cover the subject in different sections. Section 2 covers precipitation and run off. Other sections in the series will be the following:

Section 1	General terms
Section 3	Infiltration and water losses
Section 4	Hydrographs
Section 5	Floods
Section 6	Ground water
Section 7	Discharge measurements
Section 8	Quality of waters

0.4 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications.

> UNITED NATIONS. ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST. Glossary of hydrologic terms used in Asia and the Far East. 1956. Bangkok.

INDIA. INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE. Multilingual technical dictionary on irrigation and drainage. 1967.

INDIA. CENTRAL BOARD OF IRRIGATION AND POWER. Glossary of irrigation and hydro-electric terms and standard notations used in India. 1954. Manager of Publications, Delhi.

American Society of Civil Engineers. Nomenclature for hydraulics. 1962. New York.

0.4.1 All the definitions taken from ' Multilingual Technical Dictionary on Irrigation and Drainage ' are marked with asterisk (*) in the standard.

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1. SCOPE

1.1 This standard (Part XI/Sec 2) covers definitions of terms relating to precipitation and run off in the field of hydrology.

2. PRECIPITATION AND RUN OFF

2.1 Antecedent Precipitation — The precipitation occurring during some period antecedent to the defined event or some part of the defined event.

2.2 Antecedent Precipitation Index — A weighted summation of daily precipitation amounts used as an index of soil moisture. The weight given to each day's precipitation is usually assumed to be an exponential or reciprocal function of time with the most recent precipitation receiving the greatest weight.

2.3 Anti-Cyclone — An area of relatively high pressure with closed isobars, the pressure gradient being directed from the centre so that the wind blows spirally outward in a clockwise direction in the northern hemisphere, counter-clockwise in the southern hermisphere.

2.4 Channel Precipitation* — Precipitation which falls directly on surface or lakes and streams.

2.5 Cloud Burst — Rain storm of high intensity and of a relatively short duration, usually over a relatively small area.

2.6 Convective Precipitation* — Precipitation resulting from the upward movement of air that is warmer than its surrounding. It is generally of a showery nature with rapid changes of intensities.

2.7 Critical Storm Period — The duration of that storm which causes the greatest peak at a station in a drainage basin.

2.8 Cyclone — A low atmospheric pressure area manifest on the synoptic chart having a very low central pressure and surrounded by a system of closed isobars, circular or oval in form. The wind circulation is anti-clockwise around the centre (in the northern hemisphere) and is associated with heavy rain and very high winds reaching above 6 Beafort scale (55 km/h). Usually winds of 100 to 200 km/h is reached in severe cyclones.

2.9 Cyclonic Precipitation — The precipitation associated with the passage of depressions or cyclones.

2.10 Depression — The term is used for circulation on the synoptic weather chart delineated by closed isobars with wind circulating around it anti-clockwise (northern hemisphere) with or without lateral motion. It is generally associated with cloudy to rainy weather and falling pressure in the direction of its motion.

2.11 Depth Area Curve (Rainfall Intensity Area Curve) — A curve which graphically expresses relation between progressively decreasing average depth of rainfall over a progressively increasing area from centre of maximum precipitation of a storm outward to its edges.

2.12 Depth Area Duration Curve — A curve which graphically indicates the precipitation amounts for various areas and durations for a particular rainstorm.

2.13 Depth Duration Curve (Rainfall Intensity Duration Curve) — A curve which shows relationship between duration and depth of precipitation of storm for a specific area.

2.14 Depth of Run Off — The total run off from a drainage area or basin, divided by the area; expressed in either units of depth or units of volume per unit area of the basin.

2.15 Direct Run Off* — The sum of surface run off, interflow and channel precipitation.

2.16 Effective Rainfall

  a) Part of the rain that appears as run off in the stream; and

  b) In agricultural practice, that portion of total precipitation which is retained by the soil so that it is available for use for crop production (*see also* **2.42**).

2.17 Eye of the Storm — The small central region of a tropical cyclone usually extending to 15 km in diameter having the lowest pressure and associated with features like absence of rain, light winds and broken layers of clouds.

2.18 Ground Water Run Off — The part of the run off which consists of water that has passed into the earth and entered the zone of saturation, and has later been discharged into a water body.

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2.19 Hail — Small , roughly spherical lumps of approximately concentric shells of clear ice and compact snow usually ranging from 5 to 10 mm or more in diameter which fall either separately or agglomerated into larger irregular lumps precipitated during thunder storms.

2.20 Histograph — A map or chart of a river, drainage or sewer system, upon which a series of time lines are placed. These time lines give the time of transit of water, originating on a time line to flow down to the outlet of the system.

2.21 Interception — The process by which precipitation is caught and held by foliage, twigs and branches of the trees, shrubs and other vegetation, and lost by evaporation, never reaching the surface of the ground.

2.22 Isohyet — A line drawn on a map passing through places having equal amounts of rainfall recorded during the same period at these places (these lines are drawn after giving consideration to the topography of the region).

2.23 Isohyetal Map* — A map showing isohyets.

2.24 Isopercental Map — A map showing lines connecting points of equal percentage of rainfall after showing the annual or monthly rainfall at each raingauge station as a percentage of the annual long-average figures for that station.

2.25 Low (Trough) — An area of comparatively low pressure with or without closed isobars (in case of troughs). These low may be the result of movement of depression unequal heating or movement of fronts in the troposphere (lower atmosphere).

2.26 Mass Rainfall Curve (Mass Precipitation Curve) — A graph showing the accumulated precipitation against time.

2.27 Maximum Possible Precipitation — The maximum amount of precipitation that can theoretically occur for a certain duration in a drainage area or basin during the present climatic era.

2.28 Maximum Probable Precipitation — The amount of precipitation that is the physical upper limit for a given duration over a particular basin and in a designated length of time.

2.29 Mean Annual Precipitation — The mean of annual amount of precipitation observed over a period which is sufficiently long (say 30 years or more) to produce a fairly constant mean value.

2.30 Mean Annual Run Off and Mean Monthly Run Off* — The value of the annual volume of water discharged by the stream draining the area, the period of observation being sufficiently long to secure a fair mean, similarly mean monthly run off.

2.31 Meteorologically Homogeneous — If throughout any area the probability of occurrence of a storm of any given intensity over a very long period of time is the same at every point, the area is said to be meteorologically homogeneous.

2.32 Orographic Precipitation — Precipitation caused by dynamic cooling of air as an air current rises over a mountain barrier.

2.33 Overland Run Off — Water flowing over the land surface before it reaches a definite stream channel or body of water.

2.34 Percentage Run Off * — The amount of run off expressed as percentage of total rainfall on a given area.

2.35 Period of Concentration or Time of Concentration — The time taken by the run off from the farthest point of the catchment to reach the point under consideration.

2.36 Pluviograph — *See* **2.49**.

2.37 Point Precipitation* — Precipitation at a particular site in contrast to the mean precipitation over an area.

2.38 Precipitation — The total supply of water derived from the atmosphere in the form of rain, snow, dew, mist, frost, hail, sleet, etc. It is usually expressed as depth of liquid water on a horizontal surface in a day, month, or year, and designated so daily, monthly or annual precipitation.

2.39 Rainfall — The total liquid products of precipitation or condensation from the atmosphere as received and measured in a rain gauge.

2.40 Rainfall Area* — Geographical extent of a given storm.

2.41 Rainfall Distribution Coefficient — The distribution coefficient for any storm is the ratio of the maximum rainfall at any point to the mean rainfall in the basin.

2.42 Rainfall Excess (Net Rainfall) — Part of the rainfall that appears as run off in the stream (same as effective rainfall).

2.43 Rainfall Intensity (Rainfall Rate) — The amount of rain occurring in a unit interval of time, generally expressed in mm per hour.

2.44 Rainfall Intensity Recurrence Interval — The most probable time interval between the occurrence of rainfall of a given intensity and that of an equal or greater intensity. Sometimes the term is referred as Rainfall Intensity Frequency which is actually the reciprocal of recurrence interval or return period.

2.45 Rainfall Penetration — The depth below the soil or rock surface reached by a given quantity of rainfall which has passed below such

surface. The maximum extent of penetration would be up to ground water table.

2.46 Rain Gauge* — An instrument for measuring the quantity of rain that falls at a given place and time.

2.47 Rain Storm — Storm accompanied by rain.

2.48 Rate of Run Off or Discharge — The volume of water flowing in the stream channel past any given section in a unit of time.

2.49 Recording Rain Gauge (Pluviograph) — A rain gauge which automatically records, usually in graphical form the cumulative amount of rainfall with reference to time.

2.50 Residual Mass Curve* — A plotting of the year-to-year residual departure of rainfall or run off from the arithmetical average accumulated for the period under consideration.

2.51 Return Period or Recurrence Interval — Statistical parameter used in frequency analysis as measure of most probable time interval between occurrence of a given event and that of an equal or greater event.

2.52 Run Off

  a) It is defined as that portion of the precipitation which is not absorbed by the deep strata but finds its way into the streams after meeting the persistent demands of evapo-transpiration including interception and other losses. It includes surface run off received into the channels after rainfall, delayed run off that enters the streams after passing through portion of the earth, and other delayed run off that has been temporarily detained as snow-cover or stored in natural lakes or swamps.

  b) Also the total quantity of run off during a specified period.

2.53 Run Off Coefficient — The ratio of run off to precipitation.

2.54 Snow — Precipitation from the atmosphere in the form of branched hexagonal crystals or stars, often mixed with simple ice crystals, which fall more or less continuously from a solid cloud sheet. These crystals may fall either separately or in coherent clusters forming snowflakes.

2.55 Snow Pellets or Soft Hail — Precipitation of white opaque rain of ice, structure of which resembles to that of snow, the grains are spherical, or sometimes conical, about 2 to 5 mm in diameter.

2.56 Soil Moisture Deficit — The amount of water that should be applied to the soil to cause thorough drainage and is substantially equal to the soil moisture deficit then existing.

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2.57 Storm — Term commonly used for violent atmospheric motion, such as a gale, thunderstorm, rain storm, snow storm or dust storm.

2.58 Storm Track — The path traversed by the centre of the storm.

2.59 Sub-Surface Run Off (Interflow) — Run off that moves through upper soil layers and returns to the surface or appears in streams without entering the water table in the zone of saturation.

2.60 Surface Run Off — The water which reaches the stream by travelling over the soil surface or falls directly into the stream channels.

2.61 Thiessen Polygon — The points of location of rain gauges on a map are joined by straight lines and their perpendicular bisectors are drawn. The polygon formed around each rain gauge station by these perpendiculars is called, after its originator, a Thiessen polygon.

2.62 Thunderstorm — A local and short-lived atmospheric disturbance accompanied by lightning and thunder and often by showery precipitation, gusts of wind, and sometimes by hail.

2.63 Tornado — A rotary storm, one of the most violent types of storms known, of small diameter, which travels across the country and leaves great devastation along a narrow path. Its chief characteristics are the following:

    a) Under a heavy cumulonimbus cloud there hangs a funnel-shaped cloud which marks the vortex and, as the storm moves along, may or may not touch the earth;

    b) Heavy precipitation and (usually) hail occur, with thunder. In addition to the thunder, there is the roar attending the tornado cloud when it touches the surface;

    c) The winds blow spirally upward around the axis of the tornado cloud; and

    d) The speed of the storm itself in travelling over the earth is comparatively slow 40 to 65 km an hour; its path is short, averaging about 480 km.

2.64 Totalizer or Storage Rain Gauge* — A type of rain gauge which totalizes the quantity of precipitation.

2.65 Weighted Mean Monthly Precipitation — The weighted mean precipitation for each month for a large area.

2.66 Yield of Drainage Basin* — Total volume or flow from a drainage basin for a long stipulated period of time, for example ' annual yield of drainage basin ' is the mean annual run off.

2.67 Zero Moisture Index — The index of moisture when the precipitation is just adequate to supply all the water that would be needed for maximum evaporation and transpiration in the course of a year.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	$1 \ N = 1 \ kg.m/s^2$
Energy	joule	J	$1 \ J = 1 \ N.m$
Power	watt	W	$1 \ W = 1 \ J/s$
Flux	weber	Wb	$1 \ Wb = 1 \ V.s$
Flux density	tesla	T	$1 \ T = 1 \ Wb/m^2$
Frequency	hertz	Hz	$1 \ Hz = 1 \ c/s \ (s^{-1})$
Electric conductance	siemens	S	$1 \ S = 1 \ A/V$
Electromotive force	volt	V	$1 \ V = 1 \ W/A$
Pressure, stress	pascal	Pa	$1 \ Pa = 1 \ N/m^2$

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